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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/087,741

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Sang-Hyuck Ahn

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EXAMINER

DONG, DALEI

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 03/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/087,741

Applicant(s)

AHN ET AL

Examiner

Dalei Dong

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 November 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-2, 4-6, 10-11 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,645,402 to Kurokawa.

Regarding to claim 1, Kurokawa discloses in Figures 2 and 4, a method for fabricating a field emission display comprising: forming a cathode electrodes (2) on a substrate (1); forming an emitter (3) having a carbon-based material on the cathode electrode, depositing an emitter surface emitter treatment agent (20 cc of a solution obtained by diluting isobutyle methacrylate with butyl carbitol along with organic material 6) on the substrate to cover the emitter; hardening the emitter surface treatment agent; (see column 8, lines 55-65) and removing the hardened emitter surface treatment agent from the substrate such that the carbon-based material contained in the emitter can be exposed (see column 8, line 65 to column 9, line 13 and Figure 4).

Regarding to claim 2, Kurokawa discloses the step of forming the emitter further comprises: print a paste having the carbon-based material on the cathode electrodes (see

column 18, 24-27); and heat-treating the printed paste at a temperature lower than a complete-baking temperature for the paste (see column 12, lines 5-10 in view of lines 19-25).

Regarding to claim 4, Kurokawa discloses the carbon-based material is selected from the group consisting of a carbon nanotube, graphite, and diamond (see column 8, lines 55-65).

Regarding to claim 5, Kurokawa discloses the emitter surface treatment agent is deposited through a spin coating process (see column 18, 24-27).

Regarding to claim 6, Kurokawa discloses the emitter surface treatment agent is hardened by a heat-treatment process (see column 8, line 55-65).

Regarding to claim 10, Kurokawa discloses in Figures 2 and 4, a method for forming a carbon-based emitter comprising: forming an emitter (3) including a carbon-based material; forming a surface emitter treatment agent (6) over the emitter; heating the surface treatment agent for forming a treatment film; (see column 8, lines 55-65) and removing at least a portion of the treatment film (see column 8, line 65 to column 9, line 13 and Figure 4).

Regarding to claim 11, Kurokawa discloses the carbon based emitter is used in a field emission display.

Regarding to claim 15, Kurokawa discloses the carbon-based material is selected from the group consisting of a carbon nanotube, graphite, and diamond (see column 8, lines 55-65).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,436,221 to Chang in view of U.S. Patent No. 6,645,402 to Kurokawa.

Regarding to claim 1, Chang discloses a method for fabricating a field emission display comprising the steps of forming a cathode electrode (conductive pattern coated on substrate, see abstract), forming an emitter having a carbon based material (CNT, see abstract) on the cathode electrode, and depositing an emitter surface treatment agent on the substrate to cover the emitter (adhesive film, see abstract), and removing the hardened emitter surface treatment agent from the substrate such that the carbon based material contained in the emitter can be exposed, see columns 3-4 lines 49-67, and 1-5. Chang

does not disclose the step of hardening the surface treatment agent, as Chang's surface treatment agent is already hardened before deposition.

However, Kurokawa teaches a method of for fabricating a field emission display wherein the surface treatment agent (20 cc of a solution obtained by diluting isobutyl methacrylate with butyl carbitol along with organic material 6) is deposited and then hardened, see Kurokawa column 8 lines 55-65.

It would have been obvious to modify the invention of Chang to include hardening the surface treatment agent after deposition, (as disclosed in Kurokawa), versus before deposition because hardening "in-situ" increases efficiency by reducing the number of steps required in the process of manufacturing.

Regarding to claim 2, Kurokawa discloses the step of forming the emitter further comprises: print a paste having the carbon-based material on the cathode electrodes (see column 18, 24-27); and heat-treating the printed paste at a temperature lower than a complete-baking temperature for the paste (see column 12, lines 5-10 in view of lines 19-25).

Regarding to claim 3, Chang discloses wherein the paste is printed through a screen-printing process using a metal mesh screen (see abstract).

Regarding to claim 4, Kurokawa discloses the carbon-based material is selected from the group consisting of a carbon nanotube, graphite, and diamond (see column 8, lines 55-65).

Regarding claim 8, Chang discloses the method of claim 2, wherein the printed paste (CNT) is heat treated at the temperature of about 350-430 degrees C, (see abstract, Chang's CNT is sintered at a temperature of about 35-550 degrees C). Chang however does not explicitly disclose the duration of the sintering process. However, it is well known in the art to heat treat the carbon nanotubes for a few minutes at such a temperature in order to successfully perform curing. Therefore, it would have been obvious to one of ordinary skill in the art to have heat treated Chang's CNT for about 2 minutes, as is claimed, in order to solidify the CNT on the cathode electrode.

5. Claims 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,645,402 to Kurokawa in view of U.S. Patent No. 6,623,720 to Howard.

Regarding to claim 7, Kurokawa discloses in Figures 2 and 4, a method for fabricating a field emission display comprising: forming a cathode electrodes (2) on a substrate (1); forming an emitter (3) having a carbon-based material on the cathode electrode, depositing an emitter surface emitter treatment agent (20 cc of a solution obtained by diluting isobutyl methacrylate with butyl carbitol along with organic material 6) on the substrate to cover the emitter; hardening the emitter surface treatment agent; (see column 8, lines 55-65) and removing the hardened emitter surface treatment agent

from the substrate such that the carbon-based material contained in the emitter can be exposed (see column 8, line 65 to column 9, line 13 and Figure 4).

However, Kurokawa does not disclose the emitter surface treatment agent is a polyimide solution. Howard teaches a method of making a field emission display using carbon nanotubes wherein a sacrificial layer made of polyimide is deposited and then removed to better expose the nanotubes (see column 4, lines 5-10).

Howard also teaches that the removable sacrificial layer (or “surface treatment layer”) should be made of a material that does not have detrimental effects to the emissive layer, and teaches that polyimide material is a suitable sacrificial or surface treatment layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use polyimide material for the surface treatment because it is non-harmful suitable material for the removable surface treatment layer, as evidenced by Howard.

Regarding to claim 12, Howard teaches polyimide solution material as the surface treatment agent. The motivation to combine is the same as above.

6. Claims 9, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,645,402 to Kurokawa in view of U.S. Patent No. 6,013,238 to Murata.

Regarding to claim 9, Kurokawa discloses the method of manufacturing a field emission display in claim 6; however, Kurokawa does not disclose deposit the surface treatment agent located on a hot plate.

Murata teaches in column 13, lines 65-67, makes it clear that the hot plate method is a well-known, conventional method used for heating elements in field emission display. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a hot plate instead of the process of heating as disclosed by Kurokawa - since applicant has not shown that any particular advantage comes of using a hot plate at 90 degrees C for 20 minutes versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

Regarding to claim 13, since applicant has not shown that any particular advantage comes of using a hot plate at 90 degrees Celsius versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

Regarding to claim 14, since applicant has not shown that any particular advantage comes of using a hot plate for 20 minutes versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat

treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

Response to Arguments

7. Applicant's arguments filed November 22, 2004 have been fully considered but they are not persuasive.

In response to Applicant's argument that Kurokawa reference does not teach depositing an emitter surface treatment agent on the substrate to cover the emitter. The Examiner respectfully disagrees with Applicant's assertion. The Examiner asserts that as clearly show in Figure 4, the emitter surface treatment agent of 20 cc of a solution obtained by diluting isobutyl methacrylate with butyl carbitol along with organic material is deposited on the substrate (1) and covers the emitter (3). Even though, emitter surface treatment agent of 20 cc of a solution obtained by diluting isobutyl methacrylate with butyl carbitol along with organic material (6) and the emitter (3) are deposited at the same time. However, Applicant merely claims the emitter surface treatment agent cover the emitter and does not differentitate the timing of the deposition of emitter and emitter surface treatment agent. Furthermore, clearly shown in Figure 4, emitter (3) is embedded within the emitter surface treatment agent of 20 cc of a solution obtained by diluting isobutyl methacrylate with butyl carbitol along with organic material (6) and thus the emitter is covered by the surface treatment agent.

Also, in response to Applicant's argument that Kurokawa reference does not indicate that the emitter surface treatment agent of 20 cc of a solution obtained by

diluting isobutyl methacrylate with butyl carbitol along with organic material (6) is a surface treatment agent. Examiner respectfully disagrees with the Applicant's argument. The Examiner asserts that as disclosed by the Kurokawa reference the emitter surface treatment agent of organic material along with 20 cc of a solution obtained by diluting isobutyl methacrylate with butyl carbitol is applied to the surface of the chromium electrode (2) and the organic material (6) is carbonized into a carbide 8 as shown in the circle magnification in Fig. 5 and remains after the treatment of the surface with hydrogen plasma. This carbide 8 fixes the graphite particles 3 to the chromium electrode 2 (see column 9, lines 6-11). Therefore, the Examiner interprets that if the organic material turns into a carbide and bonds the graphite particle or the emitter to the surface of the cathode, it is inherent that the organic material or carbide "treats the surface" of the emitter and the cathode in order to bond the two surfaces together. Thus, the Examiner interprets that the organic material 6 is part of a surface treatment agent.

Further, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, both Chang reference and Kurokawa reference teaches a method of fabricating a field emission device. Also, Kurokawa teaches the solution of 20 cc of isobutyl methacrylate with butyl carbitol along

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with organic material after it is dried adheres the graphite particles to the electrode 2 as that of a hardened tape. Further, even though the tape of Chang is hardened before being applied, however it is old and well known in the art that a adhesive resin instead of a hardened tape material is easier to apply and also achieves a closer contact to any of the applied surface. Furthermore, the adhesive resin is able to better conform to the contour of the apparatus in which the adhesive is applied without some of the necessary bending and processing may be associated with the hardened tape material. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilize the resin and hardened process of Kurokawa for the adhesive tape material of Chang in order to achieve closer contact to the surface and provide a improved adhesiveness and thus remove the badly attached carbon nanotube and further straighten the carbon nanotube layer to a proper direction..

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dalei Dong whose telephone number is (571)272-2370. The examiner can normally be reached on 8 A.M. to 5 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar Patel can be reached on (571)272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



D.D.
March 9, 2005



Joseph Williams
Primary Examiner
Art Unit 2879